

# Terminal Flight Data Manager

## Program Overview

Presented by: Rebecca Guy  
Robert Hanes



# TFDM/Surface CDM Presentations

Program Overview	Rebecca Guy Robert Hanes	10 min
Surface Collaborative Decision Making (S-CDM) Capabilities	Marshall Mowery	20 min
Flight Operator/Air Traffic Control (ATC) Enhanced Information Exchange	Lorne Cass	15 min
Surface Situational Awareness (SSA) Capabilities	Stephen Ryan	10 min



# TFDM/Surface CDM Presentations (Continued)

Electronic Flight Data (EFD) in the ATC Tower	Kimberly Brooks	20 min
Integrated EFD and ASDE-X/ASSC Functions	Kimberly Brooks	10 min
Acquisition/ Implementation Strategies	Jim Benjamin	10 min
Q&A	Team	



# Overview

- **Presentation represents a notional plan for TFDM**
  - Program is in the midst of initial investment analysis
  - Goal is to encourage industry feedback and thoughts
- **TFDM is viewed as a portfolio**
  - TFDM system may not address all of the capabilities in the portfolio





# Overview (Con'd)

- **TFDM is a Terminal program that will:**
  - Optimize terminal and surface operations, including information exchange among stakeholders
  - Provide efficiencies through transitioning from paper flights strips to electronic flight data distribution
  - Integrate with future Traffic Flow Management capabilities (e.g. Integrated Departure/Arrival Capability (IDAC))
  - Provide some ATCT infrastructure consolidation



# Overview (Con'd)

- **Initial Work Package (“Core”)**
  - Initial S-CDM capability (2015)
    - Surface situational awareness (SSA) capability
    - Initial data exchange
  - NAS-integrated TFDM (2017-2020) for metroplex areas and selected airports
- **Potential Future Work Packages (2020+)**
  - Expanded site deployment
  - Enhanced air traffic decision support capabilities
  - ATCT automation platform consolidation in compliance with NextGen roadmaps



# Background

- **TFDM market survey released (December 2011)**
  - Did not include S-CDM concept
- **Surface Operations Office established in response to FAA commitment to RTCA Task Force 5 recommendations**



# Background

- **Agreement between PMO and Surface Operations Office to include surface initiatives under the TFDM umbrella (April 2012)**
- **PMO scope revision to increase focus on operational benefits (April 2012)**
  - FAA approval of revised scope, goals and new schedule (August 2012)

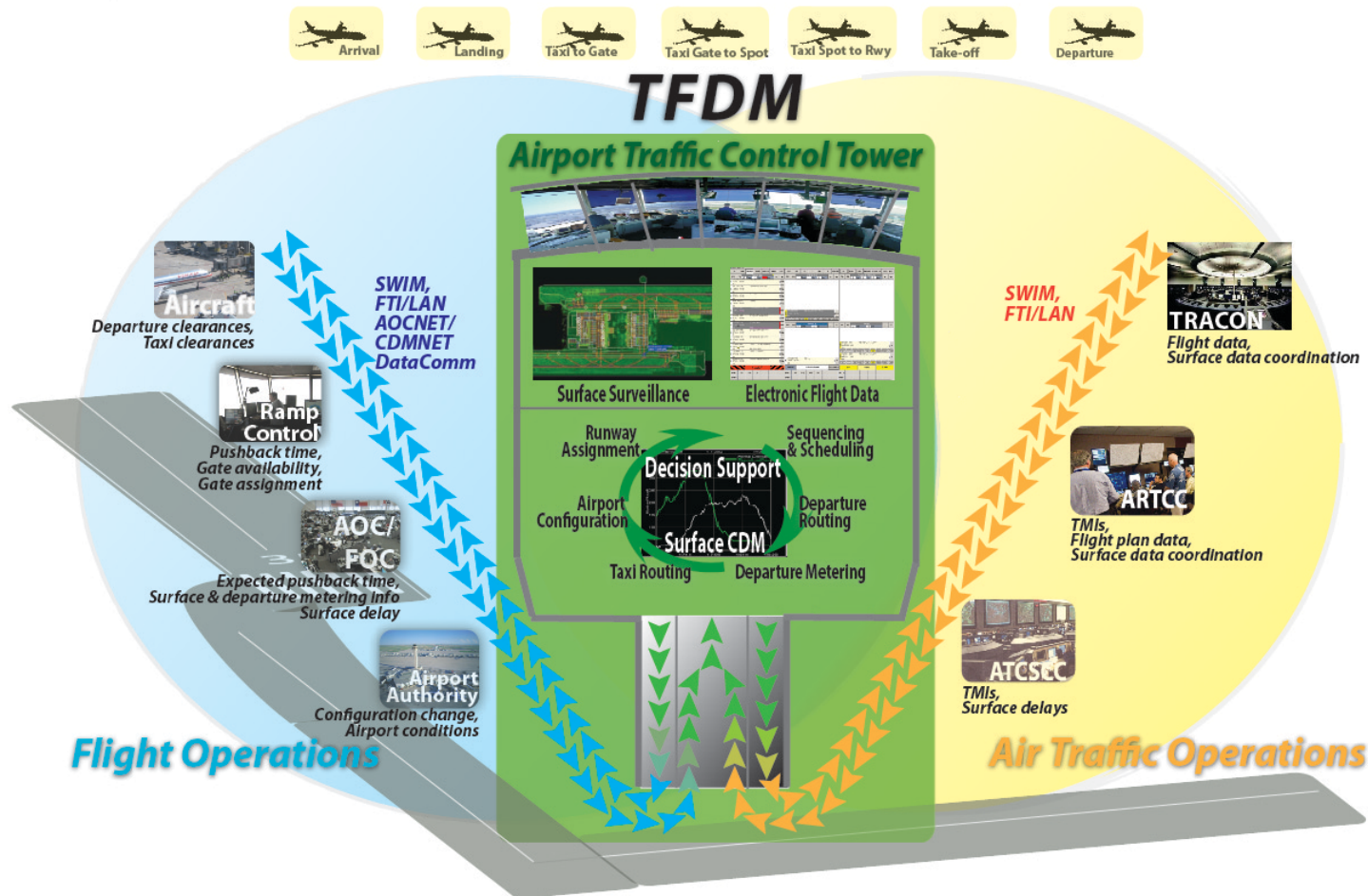


# TFDM Core Flagship Items

- **Electronic Flight Data Exchange**
- **Integration of Surveillance Data with Flight Data**
- **Initial Surface Management Capability (i.e. S-CDM)**
- **TFDM ATC Decision Support Capabilities**
  - Integration of Traffic Flow Management Data
  - Expanded S-CDM implementation
- **Enhanced Data Exchange with Flight Operators**



# TFDM Core Operational View



# Potential NAS System Transition or Replacement

- **Electronic Flight Data**

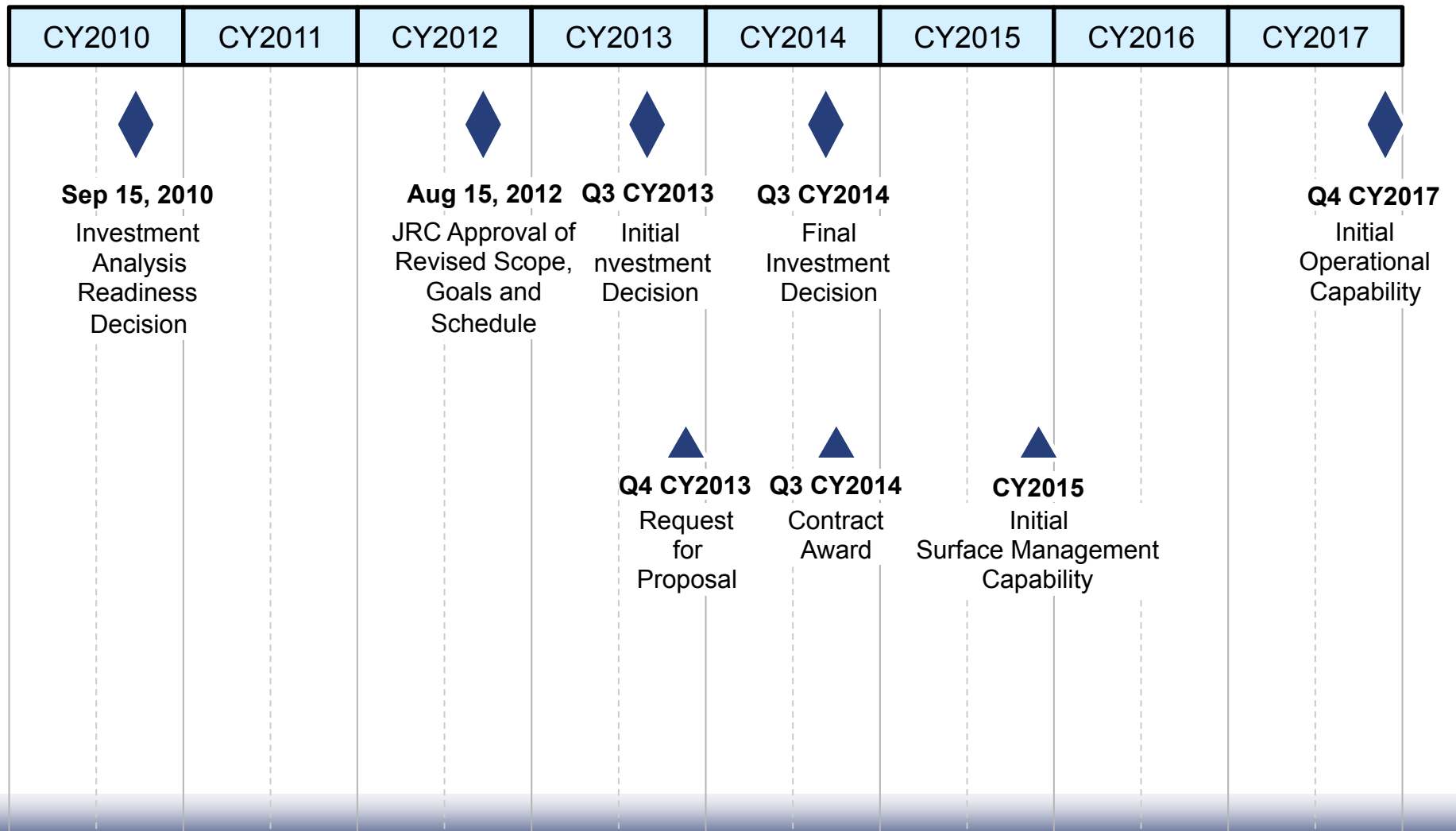
- FDIO tower components
- Flight strip bays
- ATCT drop tubes
- EFSTS components
- TDLS displays

- **TFM Integration**

- ARMT
  - DSP
  - SMA
- Allocation of functions among  
TFDM/TFMS/TBFM



# TFDM Schedule





# TFDM Core Acquisition Milestones

✓ Market Survey	Q4 CY2011
✓ Market Survey Vendor Meetings and Visits	Q2 CY2012
✓ Industry Day	Q4 CY2012
• RFP	Q4 CY2013
• Proposal Evaluation “Fly-Off”	Q1 CY2014
• Contract Award	Q3 CY2014

***Thank You!***

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# Surface Operations Office

## Surface CDM Overview

Presented by: Marshall Mowery



# Topics for Discussion

- **Surface CDM - Concept Foundation**
  - Core Capabilities
  - ‘Connecting the Dots’ from the Gate to the NAS
- **Surface CDM – Predicted Imbalance Between Demand and Capacity**
  - Enhanced information exchange enables continuous predictions of capacity and demand
  - Awareness of a pending imbalance facilitates more accurate planning



# Surface Operations Today



# Surface CDM – Five Core Capabilities

## 1. Surface Situational Awareness

- Aircraft traffic flow management improved by sharing real-time and forecast operational information which positions Stakeholders to better predict the airport operation (arrivals and departures)

## 2. Strategic planning and tactical management of airport surface traffic flows and departure queue length

- Avoid excessive taxi-out times and improve departure efficiency

## 3. Improved management of arrival traffic flows

- Increase throughput with better balance of arrival and departure demand

## 4. Analysis, measurement, and monitoring capabilities

- Objectively quantify airport operational performance, the impact of the specific airport operations on the NAS, and the performance of individual Stakeholder organizations

## 5. Global harmonization/interoperability

- Ensure synergy with international Airport/Surface CDM models and interoperability among existing and planned Surface CDM solutions



# Basics Tenets of Surface CDM

- **Know the Demand**
- **Notify Stakeholders of Predicted Imbalances**
- **Options Assessed Using ‘What If’ Modeling**
- **Collaborate as Necessary**



# Connecting the Dots

## **'SCDM' ConOps Validation**

Completes surface management integration across domains with full Stakeholder participation



## **Airport Surface Flow Management**

Procedures, Roles, and Responsibilities

Enhances NAS efficiency and reduces environmental impact



**SCDM/TFDM link to the NAS**

**Departure Reservoir Queue Management (DRM)**

Enables surface situational awareness ('SSA')

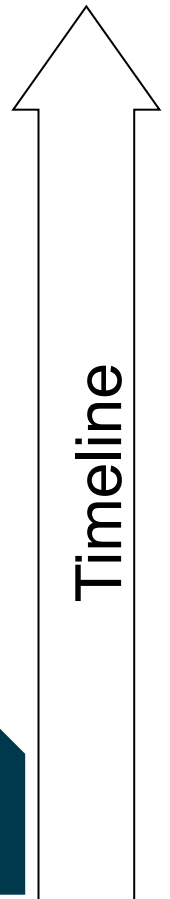


Basic Surface Surveillance

Foundation- improves predictability



Data Exchange and Integration





# Predicted Imbalance Between Demand and Capacity

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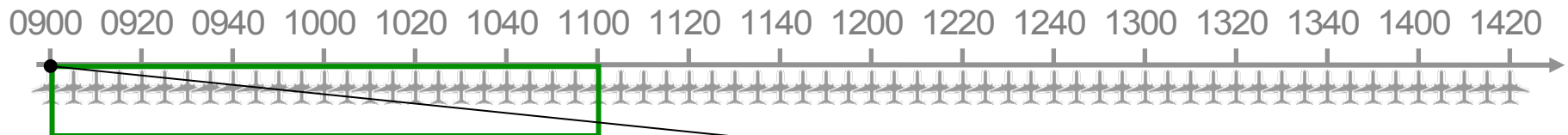
# Paradigm Shift – Understanding Real Demand

- **Today NAS decisions are made using Flight Plan (P) times to establish demand predictions**
  - Arrival/Departure throughput estimates
  - Ground Delay Programs (GDP)
  - Miles in Trail (MIT)
  - Scope and duration of Ground Stops (GS)
  - Departure Routings
- **“P-times” are often inaccurate and lead to inefficient NAS planning ...**
- **Sharing of Earliest Off Block Time (EOBT) data enables Stakeholders to more efficiently plan and predict ‘real demand’**



# Queue Management – ATL 0900Z

ATL Departures		
Flight ID	SOBT (Z)	DFIX
TRS360	1100	UGAAA
AWE308	1100	DOOLY
DAL231	1100	PNUTT
DAL1021	1115	RMBLN
DAL1138	1115	DAWGS
AAL1449	1120	JCKTS
AWE88	1122	SUMMT
DAL1600	1125	CADIT

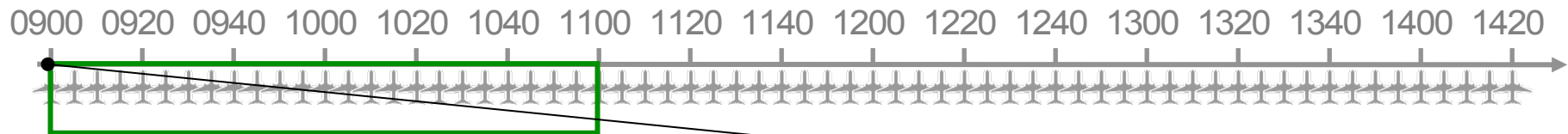


Surface CDM is **continuously predicting** the departure queue length based on real demand and other operational data as well as locally configurable parameters, including runway capacity parameters

# Queue Management – 0900Z

- **Weather Forecast**

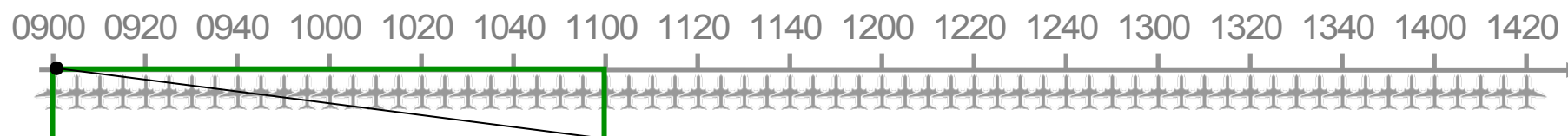
- Fog early, lifting around 1400Z
  - Wind calm
  - METAR for the airport indicates IMC conditions due to the fog
- Scattered clouds throughout the rest of the morning and early afternoon
- High probability of afternoon thunderstorms



- ATC updates the Runway Parameters
  - ATC updates the planned runway configurations based on the weather forecast and the predicted demand
  - ATC updates the planned Runway Departure Rates ('RDR') based on the weather forecast

# Departure Metering Program (DMP) Parameters – 0900Z

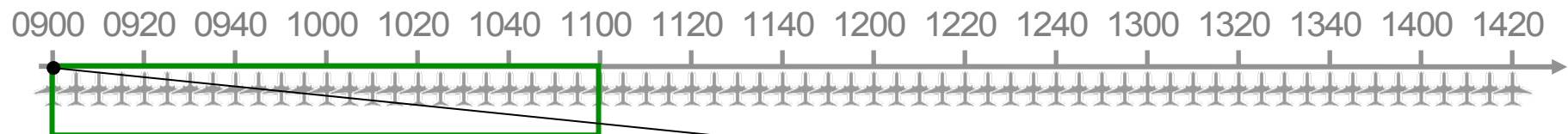
Strategic DMP Parameters	
DMP Parameter	Default Value
DMP Type	TMAT
TMAT Threshold Time	±5 minutes
Notification Lead Time	Varies per notification



- The Departure Reservoir Coordinator (DRC) evaluates the Departure Metering Program (DMP) Parameters and adjusts them to reflect the planned operations for the day

# DRC Updates Unscheduled Demand – 0900Z

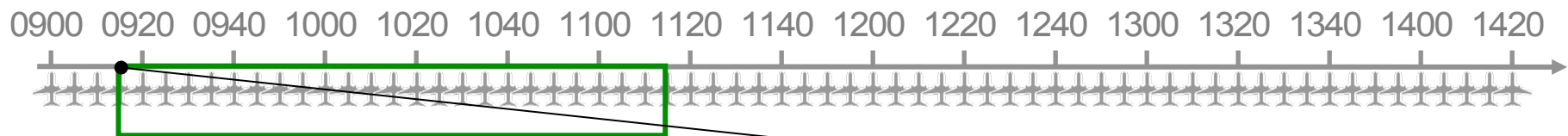
Unscheduled Demand Buffer Values (1200 – 1500Z)		
Time Period	Departure Runways	UDB
1200 – 1300Z	26L	3
	27R	0
1300 – 1400Z	26L	10
	27R	2
1400 – 1500Z	26L	10
	27R	2
	28	0



- Due to a major sporting event in Atlanta the previous night, a large number of unscheduled departures are expected the next morning
- The Departure Reservoir Coordinator (DRC) updates the Unscheduled Demand Buffer (UDB) values

# Queue Management – 0915Z

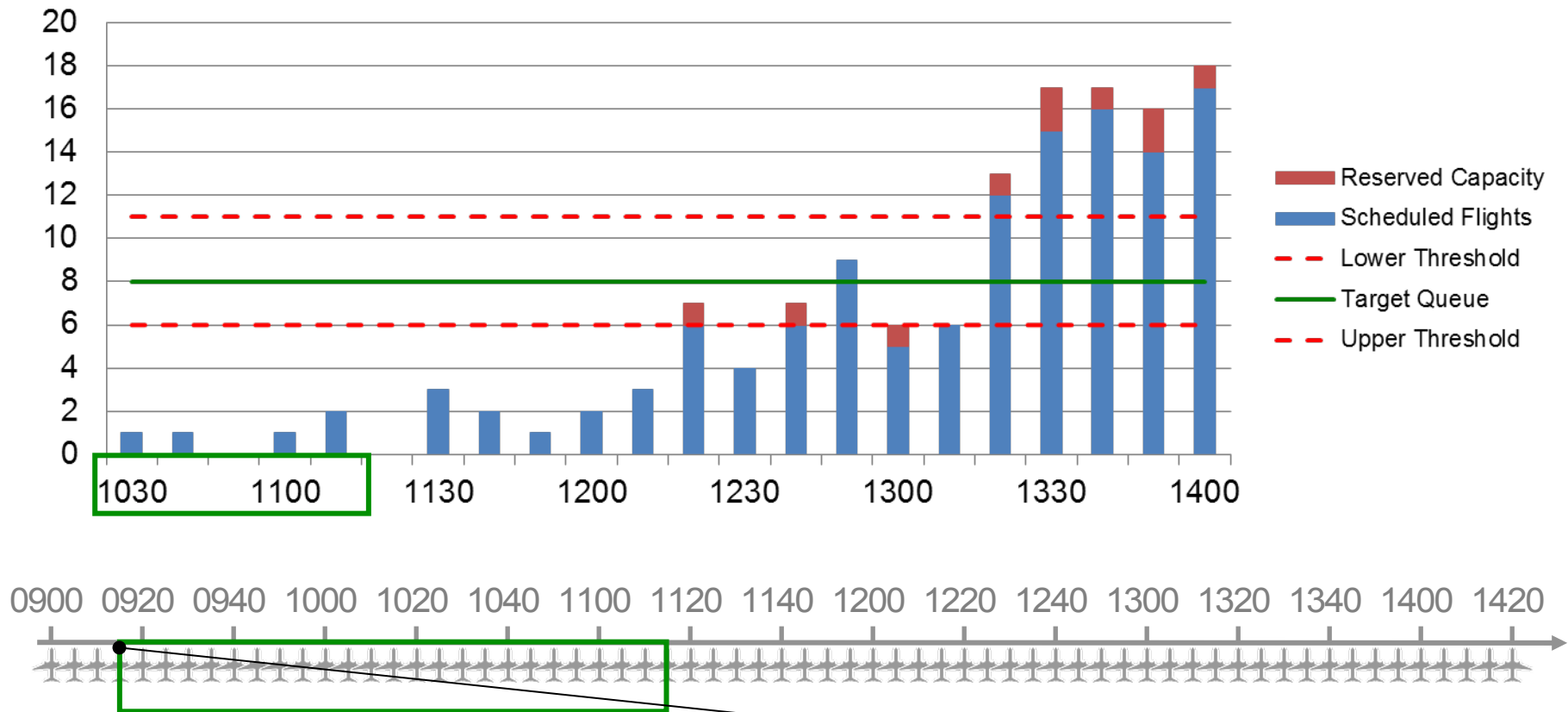
Flight ID	SOBT	Est. Takeoff Time	DFIX	Predicted Runway
DAL2027	1335	1355	JCKTS	26L
DAL1068	1335	1355	DAWGS	26L
DAL1991	1340	1400	THRSR	27R
DAL421	1340	1400	PNUTT	27R
DAL1203	1340	1400	GEETK	26L
ASQ5034	1340	1400	BRAVS	27R
DAL421	1340	1400	PNUTT	27R
DAL575	1343	1403	JOGOR	26L
DAL1775	1343	1403	GEETK	26L
FLG3982	1345	1405	DAWGS	28



- Surface CDM (SCDM) predicts runway assignments for scheduled flights based on planned runway configurations and departure fixes from filed flight plans

# Queue Management – 0915Z

Predicted 26L Departure Queues

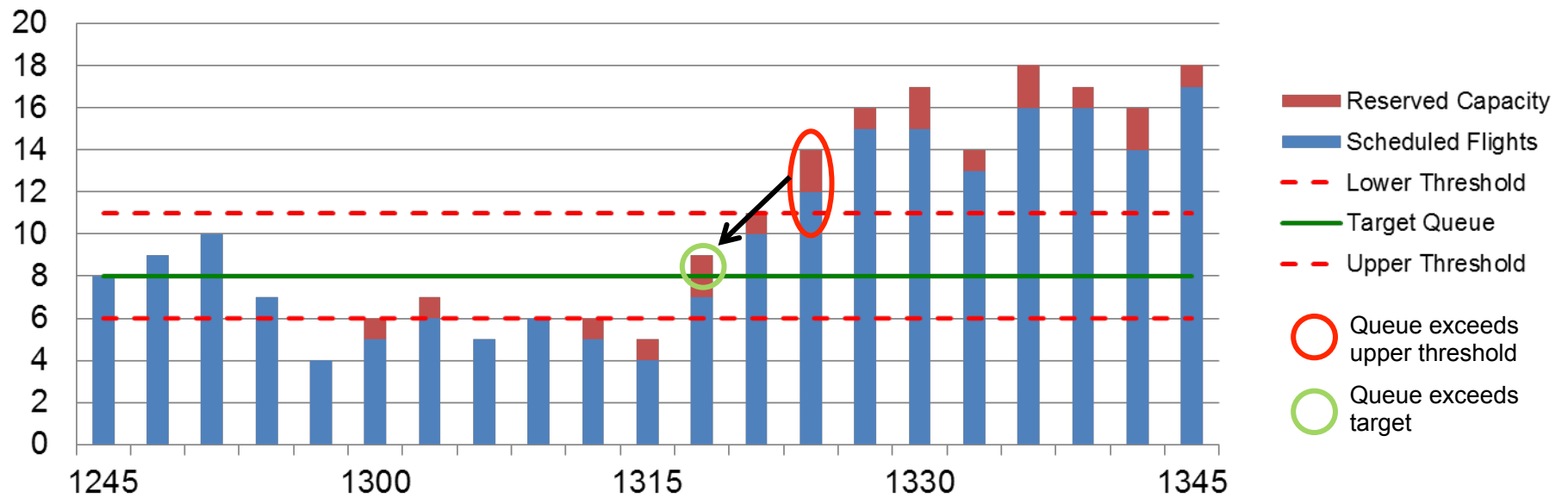


- Capacity for unscheduled flights is reserved based on the UDB



# Queue Management – Only When Needed

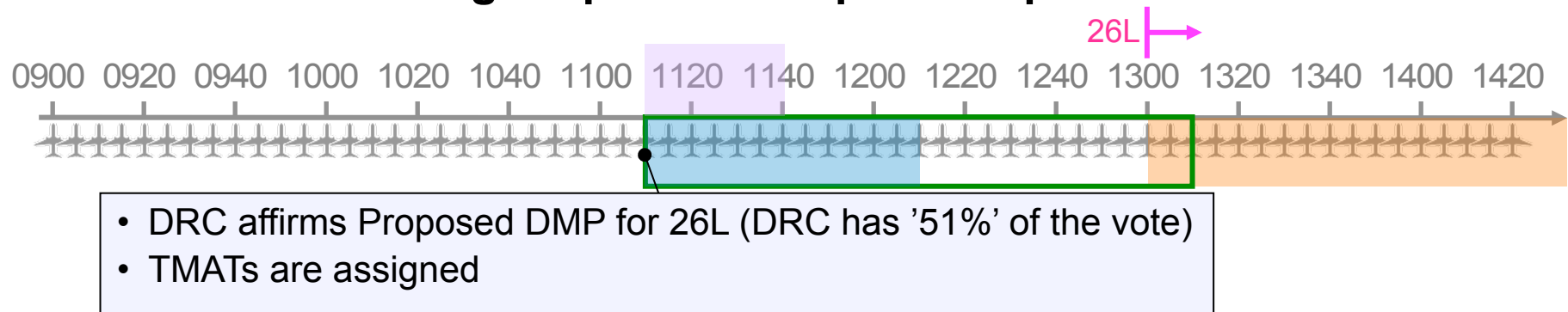
Predicted Departure Queue For Runway 26L



- The Departure Reservoir Manager (DRM) detects a demand/capacity imbalance and notifies all Stakeholders
- The 'Departure Reservoir Coordinator' (DRC) and Stakeholders assess options ('What if')
- If required, a Departure Metering Program is set beginning with the EOBT of the first flight that is predicted to enter the queue after the Target Queue Length is exceeded (DRC has 51% vote)

# Assignment of Target Movement Area Entry Times (TMAT) – 1110Z

- **Target Movement Area Entry Times ('TMAT') are assigned to:**
  - Any active flight:
    - if its EOBT is inside the Planning Horizon, or has an EDCT and the EDCT is in the Planning Horizon
  - Any cancelled flight if:
    - its Scheduled Off Block Time (SOBT) is inside the Planning Horizon and it has been 'marked' for substitution by the operator
- **TMAT assignments include a Target Off Block Time ('TOBT') which allows flight operators to plan the pushback event**



***Thank You!***



# Surface Operations Office

## Flight Operator Data Exchange

Presented by: Lorne Cass



# Outline

- **Data Exchange and Integration**
  - Foundation of SCDM
- **Exchange of CDM Data Elements**
  - TFMS Background – How CDM data are handled today
  - Applicability of CDM Elements to Surface CDM (2015)
- **SCDM Data Elements**
  - Initial Set for 2015
- **Data Quality**
  - Transparency / ‘Scorecard’
- **Policy Considerations**



# Data Exchange – Foundation to the Success of TFDM/ Surface CDM

## *'SCDM' ConOps Validation*

Completes surface management integration across domains with full Stakeholder participation

## *Airport Surface Flow Management*

Procedures, Roles, and Responsibilities

Enhances NAS efficiency and reduces environmental impact

SCDM/TFDM link to the NAS

Departure Reservoir Queue Management (DRM)

Enables shared situational awareness ('SSA')

Basic Surface Surveillance

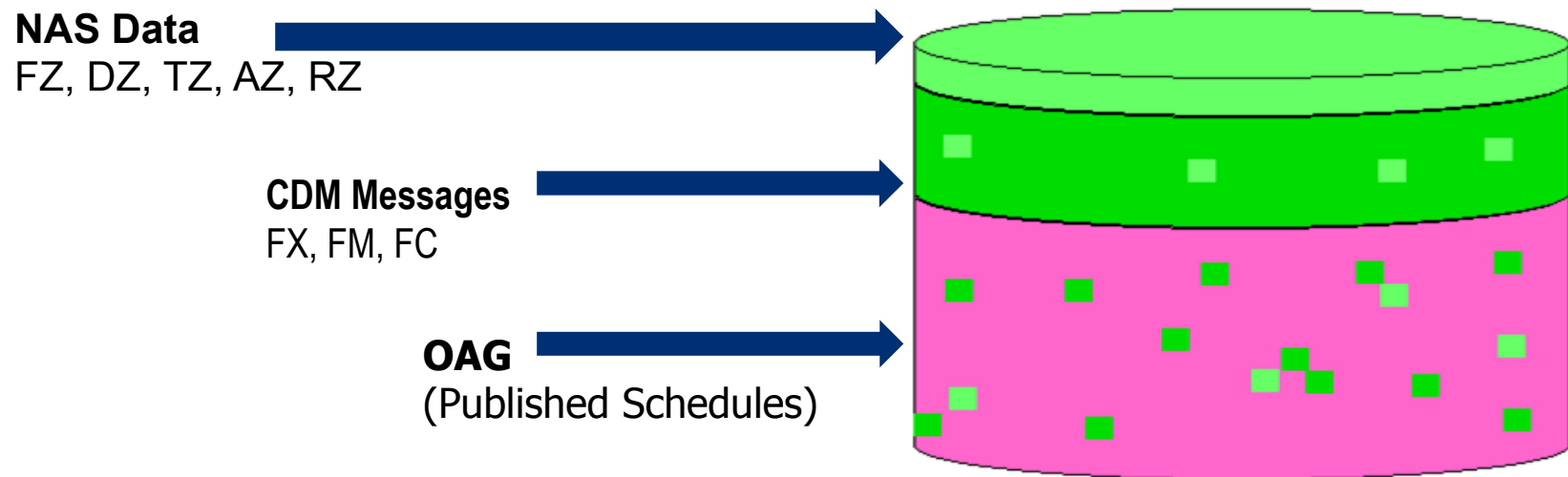
Foundation- improves predictability

***Data Exchange and Integration***

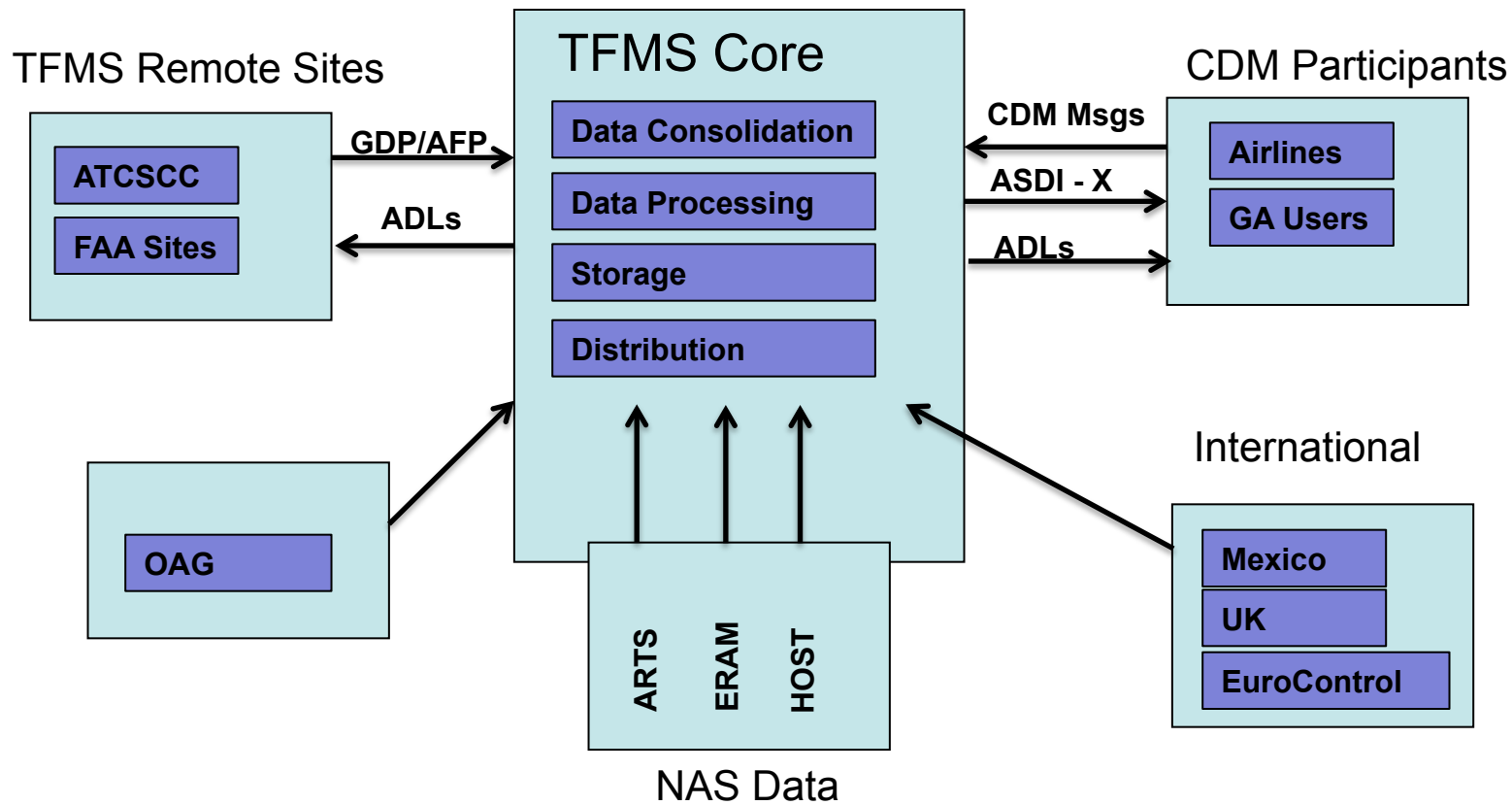
Timeline

# Handling CDM Data Elements in TFMS Today

1. Initial Flight Record - OAG data 24 hours prior to departure
2. CDM messages - update existing flight records (FM or FC msg)
3. NAS Data updates - FZ, AZ, DZ, TZ, RZ update existing flight records



# CDM Data Exchange Today





# Applicability to *Initial* SCDM Data Exchange

**Flight Operators will send initial set of nine Surface CDM data elements via three existing TFMS message types:**

- **Flight Create (FC)**
- **Flight Modify (FM)**
- **Flight Cancel (FX)**



# Proposed Initial Set of Data Elements for SCDM

## Developed by the Surface CDM Team (SCT)

Number	Data Element	Description
1	<b>Actual Off-Block Time (AOBT)</b>	The Actual time at which a flight has sent a 'block out" message from the gate or parking location.
2	<b>Actual Takeoff Time (ATOT)</b>	The time at which a flight lifts off from the runway as reported by the CDM Participant via a CDM message.
3	<b>Actual Landing Time (ALDT)</b>	The Actual time the flight has landed on the runway at the destination.
4	<b>Actual In-Block Time (AIBT)</b>	The Actual time the flight has blocked in at the gate.
5	<b>Aircraft Tail/Registration #</b>	The unique alphanumeric string that identifies an aircraft.
6	<b>Earliest Off-Block Time (EOBT)</b>	Time when the flight operator plans for an aircraft to push back from its assigned gate. Used to forecast surface demand vs. capacity



# Proposed Initial Set of Data Elements for SCDM

## Developed by the Surface CDM Team (SCT)

Number	Data Element	Description
7	Flight Cancellation	Message that indicates a flight has been cancelled.
8	Gate Assignment	Airport Gate that is assigned to a flight.
9	Initial Off-Block Time (IOBT)	The initial off-block that a flight provided. Used flight data matching .

# Existing TFMS Elements Applicable to Surface CDM

## 1. Initial Off-Block Time (IOBT)

This data element is the same as the TFMS Initial Gate Time of Departure (IGTD)

**OAG data (SGTD)**

**CDM FC Message (LGTD)**

**Flight plan data (PGTD)**

## 2. Earliest Off-Block Time (EOBT)

A Flight Operator's estimation of the earliest time that a flight will be ready to push back from the gate. Essential for Surface CDM to accurately predict demand and capacity imbalances. The EOBT for all non-active flights is derived from the first available of the following values, from highest to lowest fidelity:

**EOBT (CDM Message: FC/FM Optional field)**

**LGTD (CDM Message: FC Required Field/FM Optional field)**

**PGTD (Flight Plan)**

**SGTD (OAG)**



# Existing TFMS Elements Applied to Surface CDM Data

The following elements are linked to ACARS OOOI (Out Off On In) times provided by the Flight Operators. They are currently optional CDM fields that are provided via an FM Message. The data elements will be *required* for Surface CDM.

3. **Actual Off-Block Time (AOBT)** – CDM element T13 (Actual Gate Time of Departure) – Actual day, hour, and minute the flight pushed back from the gate. (out time from the OOOI data).
4. **Actual Take Off Time (ATOT)** – CDM element T11 (Actual Runway Time of Departure ARTD) – Actual day, hour, and minute the flight lifts off from the departure runway (off time from the OOOI data).
5. **Actual Landing Time (ALDT)** – CDM element T12 (Actual Runway Time of Arrival ARTA) – Actual day, hour, and minute the flight touched down on the arrival runway (on time from the OOOI data).
6. **Actual In-Block Time (AIBT)** – CDM element T14 (Actual Gate Time of Arrival AGTA) – Actual day, hour, and minute the flight arrived at the gate (in time from the OOOI data).



# New Surface CDM Data Elements - No 'Equivalent' Data Element Exists Today

- 7. **Aircraft Tail/Registration Number** - The unique alphanumeric string that identifies an aircraft. Sharing the unique registration number will allow the Surface system to identify possible turn-around conflicts and other departure problems.
- 8. **Gate Assignment** - Airport Gate that is assigned to a flight. Gate information will lead to more accurate ramp transit time (RTT) calculations and therefore more accurate ETD.



# Existing TFMS Data Element Applied to Surface CDM Data Elements

- 9. Flight Cancellation Information** – Surface CDM will leverage existing cancellation messages in TFMS:
- UX - Update cancelled
  - FX - Generated when an airline sends an FX cancellation message.
  - RS - an OAG cancellation.
  - RM - The flight has been removed from the TFMS database.
  - RZ - A NAS flight plan cancellation message.
  - TO - A timeout cancellation. TFMS cancels the flight because its EDT has passed and the flight has not taken off.
  - DV Cancelled - This flight has been diverted to a new arrival airport.



# Summary of Changes Impacting Flight Operators

- Data Elements - transition from Optional to *Required*
  - *AOBT, ATOT, ALDT, AIBT (OOOI Data)*
- New *Required* Data Elements
  - *Gate Assignment*
  - *Tail/Registration Number*
- New *Optional* Data Element
  - *EOBT*





# Data Quality and Transparency 'Scorecard' – ATC Stakeholder

ATC Scorecard 1/31/2012		
	Score	Grade
<b>Compliance</b>	<b>85%</b>	
Metering Ready Time Compliance	--	
Meter Time Compliance	85%	
<b>Data Quality</b>	<b>80%</b>	
Off Block Time Accuracy	--	
Data Comprehensiveness	80%	
Flight Initialization Lead Time	--	
<b>Performance</b>	<b>91.7%</b>	
Metering Hold	--	
Terminal Airborne Arrival Delays	90%	
Surface Arrival Delays	85%	
Configuration Change Efficiency	100%	

# Data Integrity Scorecard – Flight Operator

Flight Operator Scorecard		
	Score	Grade
<b>Data Quality</b>	89.7%	
Off Block Time Accuracy	95%	
Data Comprehensiveness	75%	
Flight Initialization Lead Time	99%	
Surface Surveillance Reliability	--	
	Score	Grade
<b>Compliance</b>	87.5%	
Metering Ready Time Compliance	90%	
Meter Time Compliance	85%	



Good



Satisfactory



Needs  
Improvement



N/A



# Policy Considerations

- **Data Integrity**
  - Frequency of exchange of identified data
  - Accuracy
  - Timeliness
- **Data Access**
  - Data 'Ownership'
  - Need for CDM Memorandum of Agreement (MOA)
- **Data Exchange Options for Non-CDM Members**
- **Consequences, if any, of non-compliance with stated data exchange procedures and policies**



***Thank You!***

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